DICOM Conformance Statement

syngo Dynamics Client (Standalone)

VA41

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1 Introduction

1.1 Purpose of this document

This document is a DICOM Conformance Statement for the *syngo*® Dynamics Workplace.

The *syngo* Dynamics Workplace provides diagnostic display of DICOM Images conforming to the Ultrasound Image Storage, Ultrasound Multi-frame Image Storage, X-ray Angiographic Image Storage, Nuclear Medicine Image Storage, Positron Emission Tomography Image Storage and Secondary Capture Image Storage SOP Classes. Images are reviewed through the DICOM Image Review component which displays DICOM images without any additional compression. The *syngo* Dynamics Workplace is part of the Siemens Healthineers *syngo* Suite and is designed to operate in conjunction with the *syngo* Dynamics Server. The *syngo* Dynamics Workplace uses DICOM as an external interface standard. Non-DICOM internal communication mechanisms between the *syngo* Dynamics Workplace and the *syngo* Dynamics Server are used for the transfer and display of images.

The *syngo* Dynamics Workplace provides support for the DICOM US region calibration module. When ultrasound images contain this module, the *syngo* Dynamics Workplace is able to interpret the region calibration data provided by the ultrasound acquisition unit. Standard pixel spacing attributes are also supported if provided with ultrasound captures. The *syngo* Dynamics Workplace provides support for the DICOM imager Pixel Spacing and Estimated Radiographic Magnification Factor attributes often sent with X-Ray Angiographic captures. When XA captures contain this data the *syngo* Dynamics Workplace can interpret them. In the case where no calibration data is provided by the acquisition device, captures may be manually calibrated using the *syngo* Dynamics Workplace.

1.1.1 Image display support (software)

The *syngo* Dynamics Workplace displays Ultrasound, NM, PT, SC and XA Angiographic images from the *syngo* Dynamics Server or DICOM Media.

The *syngo* Dynamics Workplace supports the image formats shown in “Table 1.1 Software Review Supported Image Formats” when displaying images using software. The *syngo* Dynamics Workplace supports the display of 8, 10, 12 and 16 bit image formats.

Table 1.1: Software review supported image formats

Photometric interpretation	Transfer syntax	Planar configuration
MONOCHROME1	Uncompressed Implicit VR Little Endian 1.2.840.10008.1.2	N/A
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	N/A
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.57	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.70	N/A
MONOCHROME2	Uncompressed Implicit VR Little Endian 1.2.840.10008.1.2	N/A
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	N/A
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	N/A
	JPEG Lossy Baseline (Process 1) 1.2.840.10008.1.2.4.50	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.57	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.70	N/A
RGB	Uncompressed Implicit VR Little Endian 1.2.840.10008.1.2	0 – Chunky
	Uncompressed Implicit VR Little Endian 1.2.840.10008.1.2	1 – Planar
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	0 – Chunky
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	1 – Planar
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.70	0 – Chunky

Photometric interpretation	Transfer syntax	Planar configuration
YBR_FULL	RLE Lossless Image Compression 1.2.840.10008.1.2.5	0 – Chunky
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	1 – Planar
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.70	0 – Chunky
YBR_FULL_422	Uncompressed Implicit VR Little Endian 1.2.840.10008.1.2	0 – Chunky
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	0 – Chunky
	JPEG Lossy Baseline (Process 1) 1.2.840.10008.1.2.4.50	0 – Chunky

1.2 Limitations

None

1.3 Sources for this document

ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) Version 3 Parts 1–20 [1].

1.4 Acronyms and abbreviations

The following acronyms and abbreviations are used in this document.

ACR	American College of Radiology
AE	Application Entity
DICOM	Digital Imaging and Communications in Medicine
FSC	File-set Creator
FSR	File-set Reader
FSU	File-set Updater
NEMA	National Electrical Manufacturers Association
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol

1.5 References

[1] Digital Imaging and Communications in Medicine (DICOM PS3.1-3.20 2016a), National Electrical Manufacturers Association (NEMA), **medical.nema.org**

2 Media storage Conformance Statement

2.1 Introduction

This section specifies the *syngo* Dynamics Workplace compliance to the DICOM media interchange. It details the DICOM media storage application profiles and roles which are supported.

This station provides DICOM interchange capabilities on CD, DVD as well as regular Windows file systems and USB media with different application profiles supported for each media type. Support for CD/DVD media is dependent on the appropriate hardware being installed on the station.

Note that the format of this section follows the format described in DICOM standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this section.

2.2 Implementation model

2.2.1 Functional definition of application entities

The *syngo* Dynamics Workplace has only one application entity: the Display/Edit application. The Display/Edit application supports the following functions:

- Display a directory listing of the DICOM File Set (FSR)
- Display images from a DICOM File Set (FSR)
- Copy images from a DICOM File Set (FSR)
- Update or Delete DICOM File Sets (FSU)
- Create DICOM File Set on a CDROM/DVD (FSC)
- Create DICOM File Set on USB media or Windows file system location (FSC)

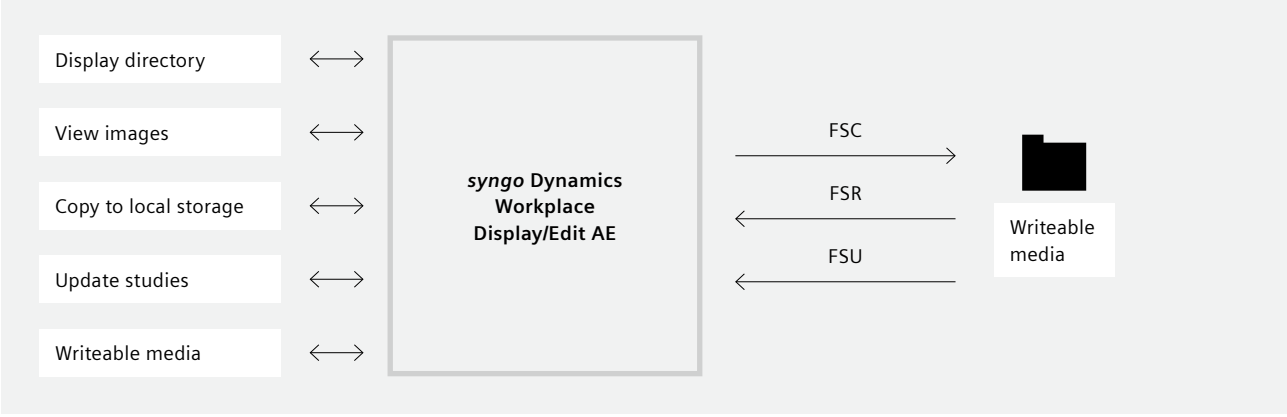
2.2.2 Application data flow diagram

The Basic and Specific application models for writeable and non-writeable media are shown in the following illustrations.

2.2.2.1 Description of the data flow diagram for writeable media

The Display/Edit application entity (AE) handles the Directory Display, image Viewing, Study Updating, Study Copying and media Creation functionality for the writeable media device. The Display/Edit application entity (AE) is commanded by the user to perform DICOM services operating on the DICOM media through the use of buttons and menu selections on the graphical user interface of the Workplace. The application models for writeable media devices are shown in the figure below.

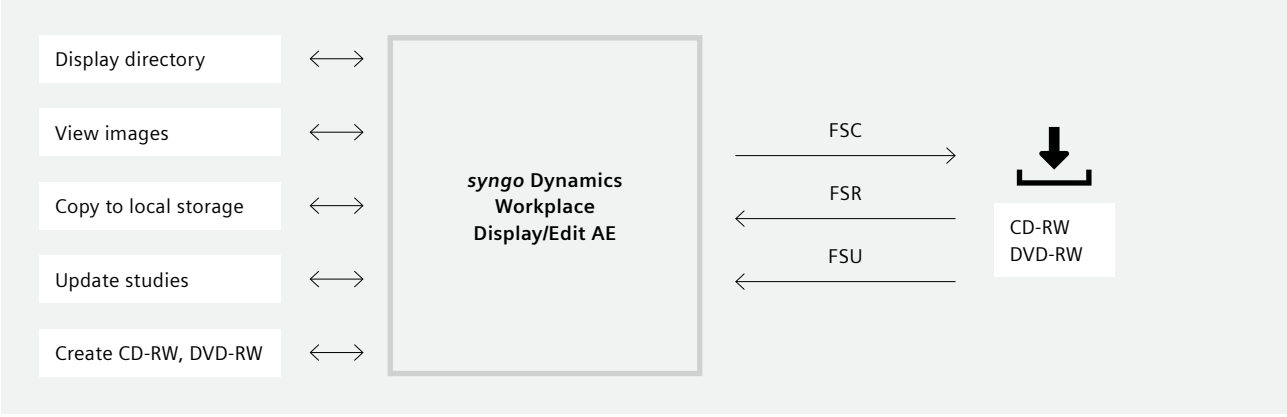
Figure 1: Writeable media implementation model



2.2.2.2 Description of the data flow diagram for the CD-RW/DVD-RW device

The Display/Edit application entity (AE) handles the directory display, image viewing, study updating, study copying and CD-RW/DVD-RW creation functionality for the CD-RW/DVD-RW device. The Display/Edit application entity (AE) is commanded by the user to perform DICOM services operating on the DICOM media through the use of buttons and menu selections on the graphical user interface of the station. The application models for the CD/DVD device (writeable media) are shown in figure 1. Note that the *syngo* Dynamics Workplace does not support any official application profiles for CD/DVD. However, DICOM media exchange files can be written and read along with a DICOMDIR in accordance with figure 2.

Figure 2: CD-RW and DVD-RW implementation model

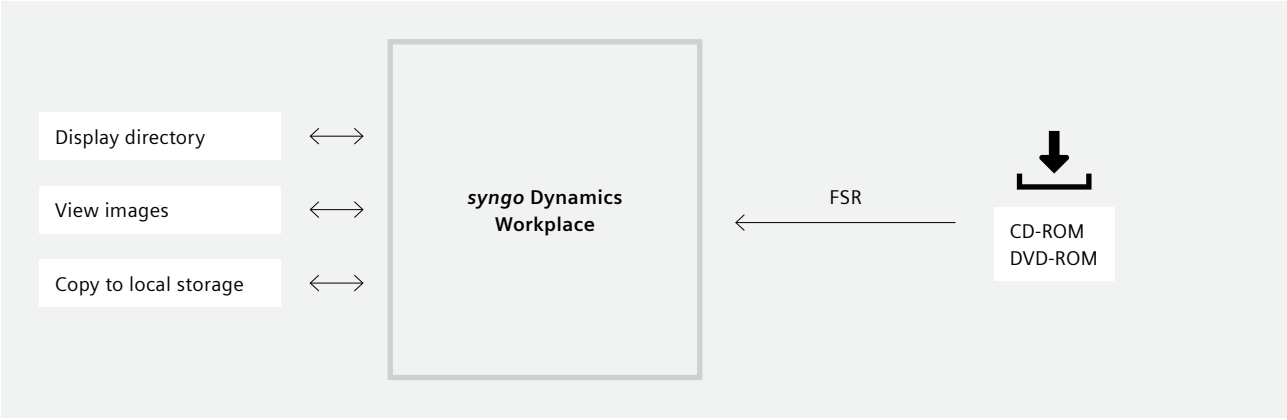


2.2.2.3 Description of the data flow diagram for non-writeable media

syngo Dynamics Workplace handles the directory display, image viewing, and copying studies off the non-writeable media to local storage functionality for the non-writeable media device.

syngo Dynamics Workplace is commanded by the user to perform DICOM services operating on the DICOM media through the use of buttons and menu selections on the graphical user interface of the Workplace. The application model for non-writeable media devices are shown in the figure below.

Figure 3: CD-ROM and DVD-ROM implementation model



2.2.3 Sequencing of real-world activities

Users of the *syngo* Dynamics Workplace initiate actions which trigger the reading, writing and updating of DICOM objects to and from the supported media.

A DICOM File Set must exist on the media for a DICOM File Set to be updated.

2.2.4 File meta information for implementation class and version

The *syngo* Dynamics Workplace Display/Edit application uses the following implementation identifying parameters:

- File Meta Information Version 1
- Implementation Class UID 1.3.12.2.1107.5.8.11.105

2.3 Application entity specifications

2.3.1 Display/Edit application entity specification

The Display/Edit application entity provides standard conformance to the DICOM interchange option of the media storage service class. The application profiles and roles are listed in the below table.

Table 2.1: Display/Edit application entity profiles, real-world activities, and roles

Supported AP's	Real-world activity	Roles	SC option
STD-US-ID-MF-CDR STD-US-SC-MF-CDR STD-XABC-CD STD-XA1K-CD STD-XA1K-DVD STD-CTMR-CD STD-CTMR-DVD STD-GEN-DVD-JPEG STD-GEN-USB-JPEG STD-GEN-USB-JPEG-2000	Display directory	FSR	Interchange
STD-XABC-CD STD-XA1K-CD STD-XA1K-DVD STD-CTMR-CD STD-CTMR-DVD STD-GEN-DVD-JPEG STD-GEN-USB-JPEG STD-GEN-USB-JPEG-2000	View images[1]	FSR	Interchange
STD-XABC-CD STD-XA1K-CD STD-XA1K-DVD STD-CTMR-CD STD-CTMR-DVD STD-GEN-DVD-JPEG STD-GEN-USB-JPEG STD-GEN-USB-JPEG-2000 STD-US-ID-MF-CDR STD-US-SC-MF-CDR STD-XABC-CD STD-XA1K-CD STD-XA1K-DVD STD-CTMR-CD STD-CTMR-DVD STD-GEN-DVD-JPEG	Copy to local storage	FSR	Interchange

[1] *Partial Conformance – See "Real-world activity: View images" on page 13.*

Supported AP's	Real-world activity	Roles	SC option
CDR STD-US-SC-MF-CDR STD-XABC-CD STD-XA1K-CD STD-XA1K-DVD STD-CTMR-CD STD-CTMR-DVD STD-GEN-DVD-JPEG	Update studies	FSU	Interchange
STD-US-SC-MF-CDR STD-XABC-CD STD-XA1K-CD	Create CD-R	FSC	Interchange
STD-XA1K-DVD STD-CTMR-DVD STD-GEN-DVD-JPEG	Create DVD	FSC	Interchange

The Display/Edit application entity provides support for media storage SOP classes shown in the below table.

Table 2.2: Supported media storage SOP classes

Information object definition	SOP class UID	Transfer syntax	Transfer syntax UID
DICOM Media Storage Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.70
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.70
		JPEG Lossless	1.2.840.10008.1.2.4.70
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Lossless	1.2.840.10008.1.2.4.70
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Lossless	1.2.840.10008.1.2.4.70
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
MR Image Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.4 1.2.840.10008.5.1.4.1.1.6.1	JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.70
		Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage SC Image (grayscale)	1.2.840.10008.5.1.4.1.1.6.1 1.2.840.10008.5.1.4.1.1.7	RLE Lossless Image Compression	1.2.840.10008.1.2.5
		JPEG Lossy, Baseline	1.2.840.10008.1.2.4.50
		Explicit VR Little Endian	1.2.840.10008.1.2.1
SC Image (grayscale) SC Image (palette color)	1.2.840.10008.5.1.4.1.1.7 1.2.840.10008.5.1.4.1.1.7	JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.70
		Explicit VR Little Endian	1.2.840.10008.1.2.1
SC Image (palette color) X-Ray Angiographic ge	1.2.840.10008.5.1.4.1.1.7 1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.70
		JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.57
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.70

The Display/Edit Application Entity provides support for media display SOP classes shown in the below table.

Table 2.2.1: Supported media display SOP classes

Information object definition	SOP class UID
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
SC Image	1.2.840.10008.5.1.4.1.1.7
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1
Digital X-Ray Image-For Processing	1.2.840.10008.5.1.4.1.1.1.1.1
Ultrasound Multi- frame Image	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Multi- frame Image(Retired)	1.2.840.10008.5.1.4.1.1.3
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1

2.3.1.1 File meta information for Display/Edit application entity

The *syngo* Dynamics Workplace source application entity title will be the AE title assigned to the *syngo* Dynamics Workplace.

2.3.1.2 Real-world activities for the Display/Edit application entity

The *syngo* Dynamics Workplace Display/Edit application entity is used for the following real-world activities:

- Display directory listing – In this activity the Display/Edit application entity acts as a File-Set Reader.
- Viewing of images – In this activity the Display/Edit application entity acts as a File-Set Reader.
- Copy to local storage – In this activity the Display/Edit application entity acts as a File-Set Reader.
- Updating images – In this activity the Display/Edit application entity acts as a File-Set Updater.
- Creating a DVD, or CD-R – In this activity the Display/Edit application entity acts as a File-Set Creator.
- Creating a Windows file system or USB media set – In this activity the Display/Edit application entity acts as a File-Set Creator.

Real-world activity: Display directory

The *syngo* Dynamics Workplace Display/Edit application is an FSR when reading the directory of the medium. This will result in an overview of the patients, studies and images in the *syngo* Dynamics Workplace study list.

Media storage application profile for the RWA: View images

For the list of Application Profiles that invoke this AE for the View Images RWA, see "Table 2. 1 Display/Edit Application Entity Profiles, Real-World Activities, and Roles". There are no extensions or specializations.

Real-world activity: View images

The *syngo* Dynamics Workplace Display/Edit Application is an FSR when viewing images from the medium.

The *syngo* Dynamics Workplace partially supports the multi-frame ultrasound "image display" Application Profile for MOD and the multi-frame ultrasound "spatial calibration" Application Profile for DVD, CD-R, Windows File System and USB media. The below table shows the supported image formats when viewing studies from re-movable media or fixed Windows file system locations.

Table 2.3: Media review supported image formats

Photometric interpretation	Transfer syntax	Bits allocated	Bits stored	Samples per pixel	Planar configuration
MONOCHROME1	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	8	8	1	N/A
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	16	16	1	N/A
	JPEG Lossy Baseline (Process 1) 1.2.840.10008.1.2.4.50	8	8	1	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.57	8	8	1	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.70	8	8	1	N/A
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	8	8	1	N/A
MONOCHROME2	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	8	8	1	N/A
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	16	16	1	N/A
	JPEG Lossy Baseline (Process 1) 1.2.840.10008.1.2.4.50	8	8	1	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.57	8	8	1	N/A
	JPEG Lossless, Non-Hierarchical (Process 14) 1.2.840.10008.1.2.4.70	8	8	1	N/A
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	8	8	1	N/A
RGB	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	8	8	3	0 – Chunky
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	8	8	3	1 – Planar

Photometric interpretation	Transfer syntax	Bits allocated	Bits stored	Samples per pixel	Planar configuration
PALETTE COLOR	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	8	8	1	N/A
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	8	8	1	N/A
	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	16	16	1	N/A
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	16	16	1	N/A
YBR_FULL	Uncompressed Explicit VR Little Endian 1.2.840.10008.1.2.1	8	8	3	0 – Chunky
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	8	8	3	0 – Chunky
	RLE Lossless Image Compression 1.2.840.10008.1.2.5	8	8	3	0 – Planar
YBR_FULL_422	JPEG Lossy Baseline (Process 1) 1.2.840.10008.1.2.4.50	8	8	3	0 – Planar

Media storage application profile for the RWA: View images

For the list of Application Profiles that invoke this AE for the View Images RWA, see "Table 2. 1 Display/Edit Application Entity Profiles, Real-World Activities, and Roles". There are no extensions or specializations.

Real-world activity: Update studies

The *syngo* Dynamics Workplace Display/Edit application is an FSU using the Interchange option when adding studies to the medium. The Display/Edit application will copy SOP instances from local storage to the medium.

The Display/Edit application cannot delete studies from media.

The Display/Edit application cannot add studies to media that has been write-protected.

Media storage application profile for the RWA: Update studies

For the list of Application Profiles that invoke this AE for the Copy to Local Storage RWA, see "Table 2. 1 Display/Edit Application Entity Profiles, Real-World Activities, and Roles". There are no extensions or specializations.

Real World Activity: Create CD-R/DVD

The *syngo* Dynamics Workplace Display/Edit Application is an FSC when creating a CD-R/DVD. A DICOMDIR is created and studies can be exported to the CD-R/DVD (See RWA: Update Studies).

Media Storage Application Profile for the RWA: Create CD-R/DVD

For the list of Application Profiles that invoke this AE for the Create CD-R RWA, see "Table 2. 1 Display/Edit Application Entity Profiles, Real-World Activities, and Roles". There are no extensions or specializations.

Real World Activity: Display Directory

The *syngo* Dynamics Workplace Display/Edit Application is an FSR when reading the directory of the medium. This will result in an overview of the patients, studies and images in the *syngo* Dynamics Workplace Study List.

Media Storage Application Profile for the RWA: Display Directory

For the list of Application Profiles that invoke this AE for the Display Directory RWA, see "Table 2. 1 Display/Edit Application Entity Profiles, Real-World Activities, and Roles". There are no extensions or specializations.

2.4 Private elements exported to media

The *syngo* Dynamics Workplace may not export all private elements of certain US SOP class objects if the private elements contain raw image data.

2.5 Augmented and private application profiles

The *syngo* Dynamics Workplace has no augmented or private Application Pro-files.

2.6 Extensions/specializations/privatizations

The *syngo* Dynamics Workplace has no extensions, specializations or privatizations of SOP Classes and Transfer Syntaxes.

2.7 Configuration

The Source AE Title encoded in the File Meta Information is derived from the AE Title of the workstation hosting the Workplace application.

2.8 Support of extended character sets

The *syngo* Dynamics Workplace supports the following character sets:

- ISO-IR 6 (default) – Default repertoire
- ISO-IR 100 – Latin Alphabet No. 1

The *syngo* Dynamics Workplace does not support multi-byte characters.

Last updated: August 2024

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The original language of this document is English.

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Published by Siemens Medical Solutions USA, Inc. · 0824 online only · *© Siemens Medical Solutions USA, Inc., 2024*